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EFFECT OF PLANT GROWTH REGULATORS ON GROWTH AND FLOWERING CHARACTERS OF AFRICAN MARIGOLD (*TAGETES ERECTA* L.) CV. PUSA NARANGI GAINDA

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ABSTRACT

The Present Investigation Entitled "Effect of Plant Growth Regulators on Vegetative Growth and Flowering Characters of African Marigold (Tagetes Erecta L.) Cv. Pusa Narangi Gainda." Was Carried out at College of Horticulture, Chiplima, Ouat During Winter 2015. The Experiment Was Conducted In Randomized Block Design With Ten Treatments Comprising of 3 Level of Ga_3 (100, 200, 300 Ppm) Level of Ethrel (200, 300, 400 Ppm) and Maleic Hydrazid (200, 300, 400 Ppm) Replicated In Three Times. The Observations Were Recorded for Growth and Flowering Attributing Characters of African Marigold. among All Treatments Ga_3 300 Ppm Resulted in the Early Flower Bud Initiation, Opening of First Flower and Maximum Plant Height, Spread, Duration of Flowering, Flower Stalk Length, Number of Flower Per Plant, Flower Weight, Flower Diameter,. Ethrel 400 Ppm Resulted in Maximum Number of Branches. Hence, on The Basis of Result Obtained From The Present Investigation It Can Be Concluded That Foliar Application of Ga_3 300 Ppm One Month After Transplanting Was Found Most Effective With Respect to Vegetative Growth Character And Flowering Behavior of African Marigold (Tagetes Erecta L.).

KEYWORDS: Ethrel, Ga_3, Maleic Hydrazide, Pusa Narangi Gainda & Tagetes erecta

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Original Article

INTRODUCTION

Marigold is an important commercial flower of India, belongs to family Asteraceae. It was originated in Central and South America especially Mexico. In India, it is thought to be introduced by Portuguese between 1502 (Mehra, 1966).Flowers are extensively used in religious and social functions in different forms. Because of their ease in cultivation, wide adaptability to varying soil and climatic conditions, long duration of flowering and attractively coloured flower of excellent keeping quality. Due to its variable height and colour marigold is especially used for decoration and included in landscape plans. African marigold is tall, erect growing plants up to three feet in height. The flowers are globose shaped and large. African marigold is very good bedding plants. Growth regulators are used in plant in small quantity enhanced or reduced plant physiological process greatly which may help in increasing the flower yield and quality. Now a days the growth, flowering and yield can be modified by increasing, reducing or modifying the physiological processes within a plant which can be carried out ny the use of growth regulators. Gibberellins fall in growth promoter group of plant hormones. Transformation of dwarf plants in to tall ones by elongation of the stems is the most drastic effect of gibberellin is (Phinney, 1956). GA_3 promotes early flowering and yield, Ethrel enhanced number of branch, thickness of stem and yield (Sachs 1961). Commercially the plant growth retardants are used for suppressing apical dominance, retarding vegetative growth, lateral buds induction and production of large number of flowers in various crops resulting in higher flower yield and easy cultivation (Naidu *et al.,* 2014). The experiment was carried out to know the optimum

dose of various growth regulators and their beneficial effect on growth and flowering behaviour of marigold.

MATERIALS AND METHODS

The investigation was carried out during winter season of 2015 at College of Horticulture, Chiplima, OUAT. The seed sowing was done on 20 September 2015. The experiment was laid out in a randomized block design with three replications having a plot size of 2.0m × 2.0 m. The seedling of African marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gainda was transplanted 25-30 days after seed sowing in the evening at a distance of 40x40 cm. The recommended dose of manure and fertilizers i.e. 30:20:20 g NPK and 10 kg FYM /m^2 was applied in experimental field where half dose of nitrogen, full dose of phosphorus and potash was thoroughly mixed in the soil at the time of preparation of bed. The remaining half dose of nitrogen was applied one month after transplanting of seedlings. Irrigation was done just after transplanting and subsequent light watering was done for better establishment of all seedlings. After establishment of plants field was irrigated at 15 days interval throughout the cropping period, harvesting of marigold fully open flowers are harvested during cool hours either in morning or evening time and first harvesting (93.00 days) and last harvesting (143.00 days).

The treatments included three levels of Gibberellic acid (100,200 and 300 ppm), Ethrel (200, 300 and 400ppm) and Maleic hydrazide (200, 300 and 400ppm). Spraying of growth regulators were done 30 days after transplanting. The vegetative characters such as height of plant, spread and number of branches per plant and flowering characters includes days taken to first flower bud initiation, days taken to opening of first flower, duration of flowering, length of flower stalk (cm), diameter of flower (cm), number of flower per plant were recorded in five randomly selected plants per replication in each treatment. Data were analyzed by method suggested by Fisher and Yates (1949).

RESULTS AND DISCUSSIONS

Vegetative Growth Attributes

Performance of vegetative growth attributes of African marigold cv. Pusa Narangi Gainda of different treatments given in table 1.

Height of Plant

The results revealed that maximum plant height (75.93 cm) was recorded with the application of GA_3 300 ppm followed by GA_3 @ 200 ppm and Ethrel @ 200 ppm while minimum plant height was obtained in MH @ 400 ppm followed by Ethrel (400 ppm) and MH (300 ppm). Promotive effect of gibbrellin on growth may be due to increasing auxin level in the tissues or enhancement of the conversion of tryptophane to IAA which caused the cell division and cell elongation. Similar results were also reported by Kumar *et al.* (2006).

Spread of Plant

Significantly maximum spread of plant (50.07 cm) was observed with the application of GA_3 300 ppm followed by application of GA_3 @ 200 ppm and ethrel @ 200 ppm. Minimum spread of plant was found in ethrel@ 400 ppm (36.30) followed by MH @ 400 ppm and MH @ 300 ppm. Foliar application of GA_3 resulted hyper elongation of internodal length causing extension in plant height while increase in total count of main axis. This consequently increases the number of dormant buds from where primary branches originated which resulting more spread of plant. These results are in close conformity with the study of Mehar *et al.* (1990).

Number of Branches

Numbers of branches (44.73) were recorded maximum with Ethrel @ 400 ppm treatment followed by MH @ 400 ppm and MH @ 300 ppm. Minimum numbers of branches found in Control (23.97) followed by Ethrel @ 200 ppm and GA_3 @100 ppm. The increased number of branches and basal diameter of stem was also reported with ethrel 400 ppm in marigold (Kumar *et al.,* 2010).

Table 1: Effect of Plant Growth Regulators on Vegetative Growth Attributes of Marigold

Treatments	Height of plant (cm)	Spread of plant (cm)	Number of branches
T_1 (Control)	68.21	39.16	23.97
T_2 GA_3 (100 ppm)	69.61	43.14	33.86
T_3 GA_3 (200 ppm)	74.41	46.30	34.00
T_4 GA_3 (300 ppm)	**75.93**	**50.07**	35.00
T_5 Ethrel (200 ppm)	72.06	44.80	29.67
T_6 Ethrel (300 ppm)	60.60	41.42	38.74
T_7 Ethrel (400 ppm)	56.52	36.30	**44.73**
T_8 MH (200 ppm)	62.92	45.78	35.14
T_9 MH (300 ppm)	58.00	38.57	35.92
T_{10} MH (400 ppm)	56.00	38.40	37.40
SEm±	3.89	2.72	2.65
CD at 5%	11.57	8.09	7.88

Flowering Attributes

Performance of flowering attributes of African marigold cv. Pusa Narangi Gainda of different treatments given in table 2.

Days Taken to First Flower Bud Initiation

Earliest bud initiation (48.00 days) was observed with the application of GA_3 @ 300 ppm followed by GA_3 @ 200 ppm and GA_3 @ 100 ppm while Late bud initiation was taken place in ethrel @ 400 ppm MH @400 ppm (65.53 days) followed by MH @ 300 ppm. Gibberellin reduces juvenile period and early termination of juvenile phase. This results in production of buds in the shoot apical meristem of the branches instead of producing leaves (Dahiya and Rana, 2001).

Days Taken to Opening of First Flower

Minimum number of days taken to opening of first flower (89.87 days) was observed in plants treated with GA_3 @ 300 ppm followed by GA_3 @ 200 ppm and GA_3 @ 100 ppm. While maximum number of days taken to opening of first flower was observed in MH @ 400 ppm (114.53 days) followed by Ethrel @ 400 ppm and Ethrel @ 300 ppm. Similar result was observed by Kumar et al. 2014.

Duration of Flowering

GA_3 was most found effective in extending the flowering duration (50.47 days) especially with GA_3 300 ppm followed by GA_3 @ 200 ppm and GA_3 @ 100 ppm. The possible cause for it might be the advanced stage of flowering in marigold (Dutta *et al.,* 1998).

Length of Flower Stalk

Significantly maximum flower stalk length was recorded with foliar spray of GA_3 300 ppm (8.95 cm) followed by Ethrel @200 ppm, MH @200 ppm and GA_3 @ 200 ppm. Promotion of protein synthesis with higher dry matter of apical dominance , enhanced cell division and cell enlargement It might be the reason for longest flower stalk due to GA_3 @ 300 ppm (Dalal *et al.,* 2009). Minimum flower stalk length was found with foliar spray of Ethrel @ 400 ppm (7.34 cm) followed by Control and MH @ 400 ppm.

Table 2: Effect of Plant Growth Regulators on Flowering Attributes of Marigold

Treatments	Days taken to flower bud initiation	Days taken to opening of first flower	Duration of flowering	Length of flower stalk (cm)
T_1 (Control)	58.72	99.40	36.20	7.46
T_2 GA_3 (100 ppm)	53.94	91.66	46.32	7.68
T_3 GA_3 (200 ppm)	49.00	91.48	47.40	7.93
T_4 GA_3 (300 ppm)	**48.00**	**89.87**	**50.47**	**8.95**
T_5 Ethrel (200 ppm)	58.20	101.72	43.00	8.00
T_6 Ethrel (300 ppm)	60.67	104.68	43.48	7.62
T_7 Ethrel (400 ppm)	71.34	111.47	45.93	7.34
T_8 MH (200 ppm)	61.52	100.60	39.33	8.00
T_9 MH (300 ppm)	62.20	103.53	40.33	7.89
T_{10} MH (400 ppm)	65.53	114.53	41.80	7.50
SEm±	2.66	2.53	1.04	0.24
CD at 5%	7.92	7.53	3.11	0.79

Yield Attributes

Performance of yield attributes of African marigold cv. Pusa Narangi Gainda of different treatments given in table 3.

Diameter of Flowers Per Plant

Highest GA_3 concentration increases flower diameter (8.73 cm) followed by GA_3 @ 200 ppm and MH @200 ppm and minimum flower diameter was found in Control (6.75) Followed by MH @ 400 ppm and GA_3 @ 100 ppm. Tyagi and Kumar (2006) also found similar results.

Number of Flowers Per Plant

Higher GA_3 concentration increases number of flower per plant 60.33 followed by GA_3 200 ppm GA_3 100 ppm and minimum number of flower per plant was found in Control (45.14) followed by MH @ 200 ppm and Ethrel @ 200 ppm. The large number of lateral production at early stage of growth leads to the enhancement in number of flowers per plant. It might be due to getting sufficient time to accumulate carbohydrate for sufficient and proper flower bud differentiation resulted in enhanced reproductive efficiency (Sunitha *et al.,* 2007).

Weight of Flower

Weight of flower were found to highest i.e. 13.13 g/ flower with the treatment with GA_3 300 ppm followed by GA_3 @ 200 ppm and Ethrel @ 400 ppm, MH @ 200 ppm. Lighest flower found in Control (9.27gm / flower)followed by ethrel @200 ppm and MH @ 300 ppm. Similar result was confirmed by Ramdevaputra *et.al*. (2009) and Kumar *et al.* (2011).

Table 3: Effect of Plant Growth Regulators on Yield Attributes of Marigold

Treatments	Number of flowers per plant	Diameter of flowers per plant (cm)	Weight of flower (g)
T_1 (Control)	45.14	6.75	9.27
T_2 GA_3 (100 ppm)	50.60	7.14	10.88
T_3 GA_3 (200 ppm)	56.60	8.00	11.06
T_4 GA_3 (300 ppm)	**60.33**	**8.73**	**13.13**
T_5 Ethrel (200 ppm)	46.92	7.43	10.67
T_6 Ethrel (300 ppm)	49.60	7.50	10.90
T_7 Ethrel (400 ppm)	50.80	7.57	11.00
T_8 MH (200 ppm)	46.60	7.77	11.00
T_9 MH (300 ppm)	48.10	7.63	10.96
T_{10} MH (400 ppm)	50.00	7.10	10.72
SEm±	2.35	0.54	0.54
CD at 5%	6.98	1.60	1.61

CONCLUSIONS

On the basis of result obtained from the present investigation it can be concluded that foliar application of GA_3 300 ppm one month after transplanting was found most effective with respect to vegetative growth character and economic flowering behaviour of African marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gainda. This can be used for maximize the return from marigold cultivation in western region of Odisha.

REFERENCES

1. ***Dahiya, D.S. and Rana, G.S. (2001)*** *Regulation of flowering in chrysanthemum as influenced by GA and shade house of different intensities. South Ind. Horti.* ***49:*** *313-314.*
2. ***Dalal, S.R. , somavanshi, A.V. AND karale, G.D.(2009)*** *Effect of gibberellic acid on growth, flowering, yield and quality of gerbera under polyhouse conditions, International Journal of Agricultural Sciences,* ***5****(2): 355-356.*
3. ***Dutta, J.P.; Seemanthini, R. and Ramdas, S. (1998)****Growth and flowering response of chrysanthemum to growth regulators treatments. Orissa J. Hort.* ***26*** *(1):70-75.*
4. ***Fisher, R.D. and Yates, F. (1949)*** *Statistical table for biological and medical research. Oliver and Boyd. Edberg (London), 3rd Ed*
5. ***Kumar, A., Kumar, J., Mohan, B., Singh, J.P., Rajbeer and Ram, N. (2011)*** *Effect of plant growth regulators on growth, flowering and yield of African marigold (Tagetes erecta L.) cv. PUSA NARANGI GAINDA, Asian Journal of Horticulture,* ***6****(2): 418-422.*
6. ***Kumar. J.; Singh P. and Pal, K. (2006)*** *Effect of growth substances on flowering and bulb production in tuberose (Polianthes tuberosa L.) cv. Pearl Double: J. of Orna. Hort.* ***9****(3), 227-228.*
7. ***Kumar,R ; Ram, M. and Gaur, G.S. (2010)*** *Effect of GA_3 and ethrel on growth and flowering of African marigold cv. Pusa Narangi Gainda: Ind. J. Hort.* ***67,*** *362-366(special issue).*
8. ***Mehara, K.L. (1966)*** *Portuguese introduction of plant in India: Indian Hort.* ***10****(4), 23-25.*
9. ***Mehar, S.P.; Jiotode, D.J.; Turkhede, A.; Darange, S.O.; Ghatol, P.V. and Dhawad, C.S. (1990)*** *Effect of planting time and growth regulator treatments on flowering and yield of chrysanthemum: Crop Res. Hisar,* ***18****(3), 345-348.*

10. ***Naidu, J. H., Ashok, P., Chandra, R. S. and Sasikala, K. (2014)*** *Effect of plant growth retardants and spacings on vegetative growth and flower yield of African marigold (Tagetes erecta L) cv Pusa Narangi Gainda: International Journal of Farm Sciences* ***4****(2), 92-99.*

11. ***Sachs, R.M. (1961****) Gibberellin, Auxin and growth retardant affect cell division and shoot histogensis: Advanced chemistry,* ***28****, 49-58.*

12. ***Phinney,B.O. (1956)*** *Growth response of single-gene dwarf mutants in maize to gibberellic acid: Proceeding of N.A.S.,* ***42****, 185-189.*

13. ***Ramdevputra, M.V., Deshmukh, H.N. , Butani, A.M. , Savaliya, J.J. , Pansuriya , A.G. and D.R. Kanzaria (2009)*** *Effect of different gibberllic acid (GA_3) concentrations on growth, flowering and yield of african marigold: The Asian Journal of Horticulture,* ***4*** *(1), 82-85.*

14. ***Sunitha; H.M.; Ravi, Hanje; Vyakaranahal, B.S. and Bablad, H.B. (2007)*** *Effect of pinching and growth regulators on plant growth, flowering and seed yield in African marigold (Tagetes erecta L.): J. of Orna. Hort.* ***10****(2), 91-95.*

15. ***Tyagi, A.K. and Kumar, V. (2006)*** *Effect of gibbrelic acid and vermi compost on vegetative growth and flowering in African marigold (Tagetes erecta Linn.): J. Orna. Hort.* ***9****(2), 150-151.*